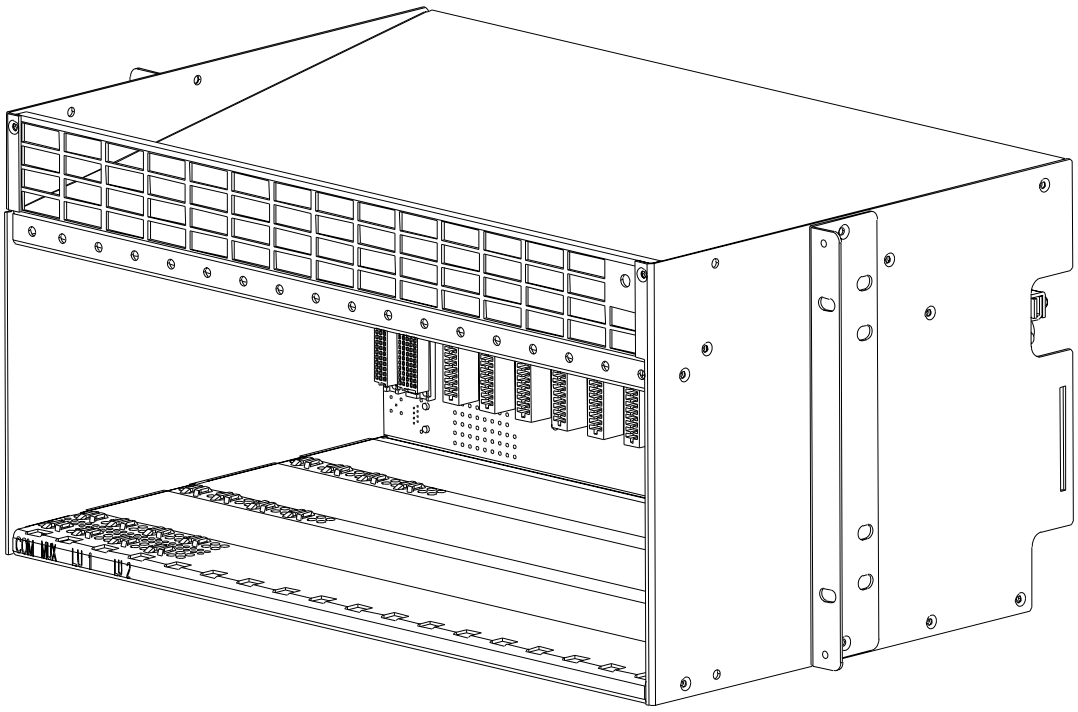
PG-FLEX *PLUS*

CENTRAL OFFICE TERMINAL SHELF

Model	List Number	Part Number
PCS-818	1	150-2618-01



PAIRGAIN TECHNOLOGIES, INC.
ENGINEERING SERVICES TECHNICAL PRACTICE
SECTION 950-818-100-01

PAIRGAIN

Revision History of This Practice

Revision	Release Date	Revisions Made
01	November 30, 1999	Initial release.

USING THIS TECHNICAL PRACTICE

Three types of messages, identified by icons, appear in the text.

Notes indicate information about special circumstances.

Cautions indicate the possibility of equipment damage or the possibility of personal injury.

You must wear an antistatic wrist strap connected to the ESD jack on the PG-Flex*Plus* chassis to perform the installation procedures. You must also observe normal ESD precautions when handling electronic equipment. Do not hold electronic plugs by their edge. Do not touch components or circuitry.

Abbreviations used in this practice are defined in “Abbreviations” on page 20.

INSPECTING YOUR SHIPMENT

Upon receipt of the equipment:

- Unpack each container and visually inspect the contents for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to PairGain. Order replacement equipment, if necessary.
- Check the packing list to ensure complete and accurate shipment of each listed item. If the shipment is short or irregular, contact PairGain as described in the “Limited Warranty” on page 21. If you must store the equipment for a prolonged period, store the equipment in its original container.

TABLE OF CONTENTS

OVERVIEW

The PairGain® PG-Flex*Plus TM* 19-inch Central Office Terminal (COT) shelf, PCS-818 List 1, supports a common management and alarm unit, an E1 multiplexer unit, and up to sixteen Central Office Line Units (COLUs).

DESCRIPTION AND FEATURES

The PCS-818 provides convenient mounting of a COT shelf PG-Plus Alarm Unit (PAU) or PG-Plus Alarm Management Unit (PMU) and Central Office Line Units (COLUs); and furnishes termination points for subscriber circuits, alarm, power, and E1 interfaces. All circuit boards are installed from the front of the COT shelf. Interconnections for PG-Plus units are located on the backplane at the rear of the COT shelf. The PCS-818 COT shelf accommodates the following PG-Plus units (see Figure 1):

- 16 COLUs
- One Multiplexer Unit (PMX)
- One PAU or one PG-Plus Management Unit.

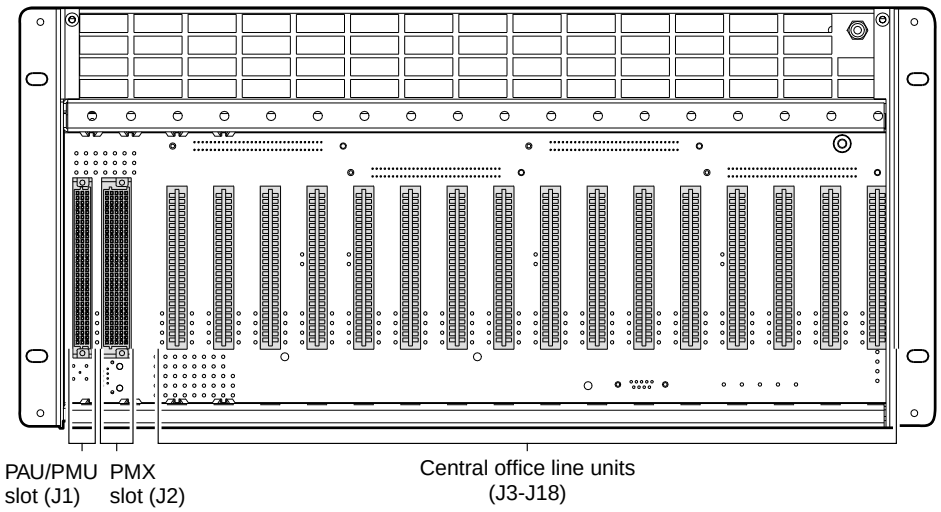


Figure 1. *Front View of the PCS-818 List 1 COT Shelf*

The COT shelf features:

- Wire-wrap connections for HDSL, alarm cutoff, and alarm relays
- Screw terminal connections for frame ground and Central Office (CO) battery
- DB-9 connector for network management communications
- 64-pin Telco connectors for CO lines
- Fits into a Electronic Industries Association (EIA) 19-inch and European Telecommunications Standards Institute (ETSI) frames
- Wire-wrap connections for G.703 data and reference clock interfaces
- Ethernet 10Base-2 and 10Base-T connections for network management or multi-shelf communications.

OPERATION

Data Channel Overview

The COT shelf backplane uses redundant Pulse Code Modulation (PCM) transmit and receive buses and Serial Communications buses (SCB) for data transfer and intra-COT shelf communications. Individual clock, data, and synchronization buses originate from the PMX card and terminate at each COLU position. The COT shelf provides the signal connectivity and –48 Vdc power distribution in the COT shelf. Figure 2 shows the backplane signal interconnection.

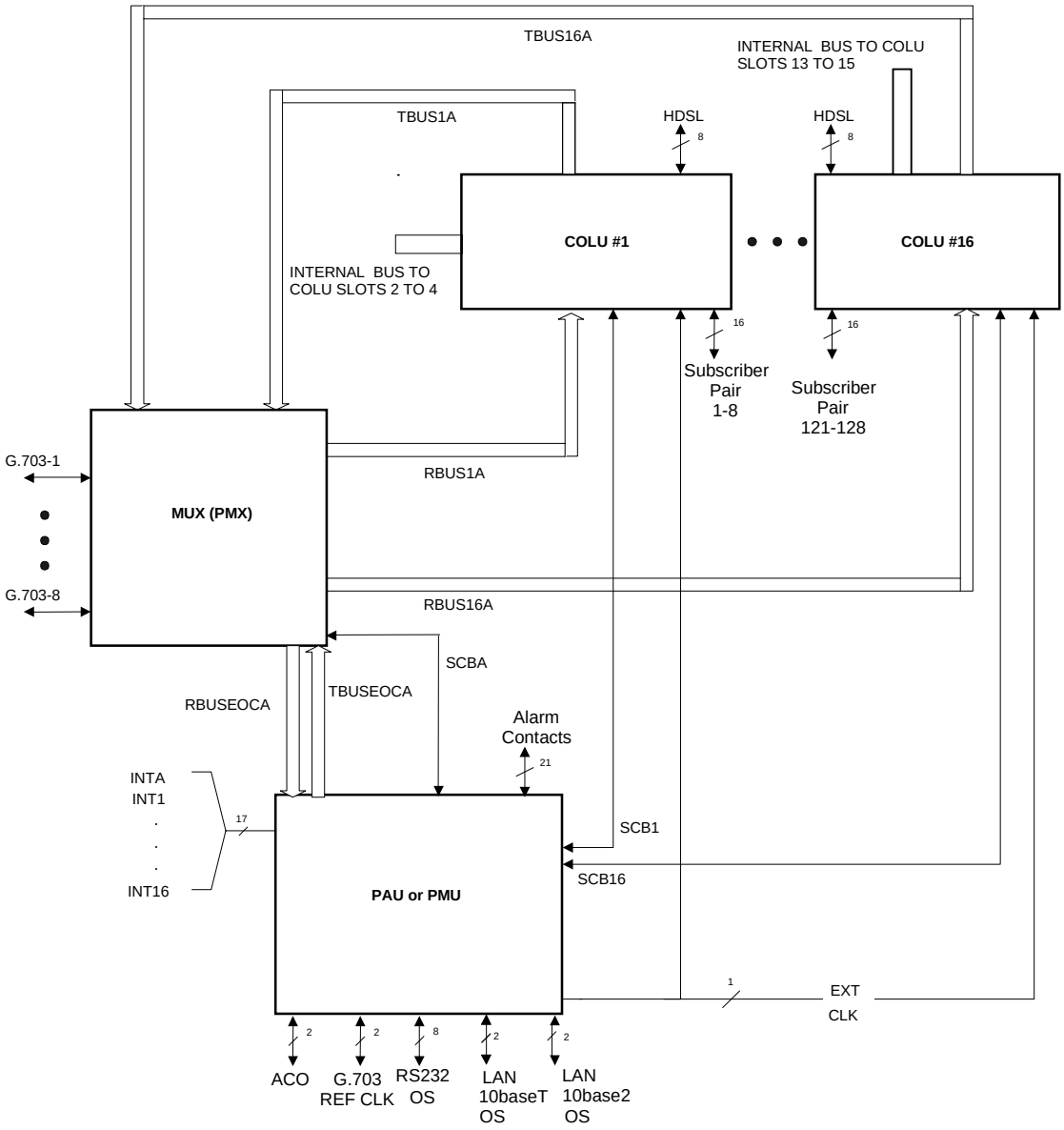


Figure 2. *Backplane Signal Configuration*

Serial Communications Bus

The SCB provides the means for the PAU/PMU to communicate with all other boards in the COT shelf to allow:

- Software downloads
- Generation of status, alarm, and performance reports through the PG-Flex*Plus* Console menus
- Provisioning of each unit installed in the COT shelf through the PG-Flex*Plus* Console menus

Communication Requests

The COT shelf provides a path for communication requests from each of the cards to the PAU/PMU slot. These signals are used by the COLU and PMX units to initiate communication with the PAU/PMU.

Backplane Connections

Each COT shelf supports the connection of up to sixteen COLUs, one PMX unit and one PAU/PMU. The backplane of the PCS-818 COT shelf contains the connectors shown in Figure 3 and Table 1.

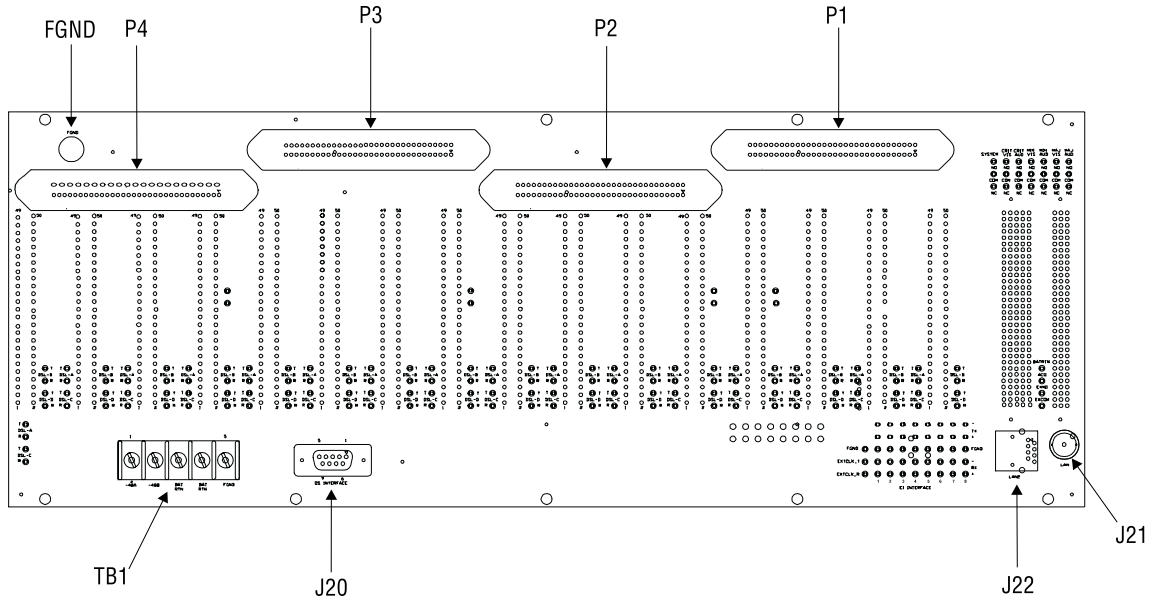


Figure 3. *PCS-818 COT Shelf Backplane*

The following sections identify each connector by type and function.

Table 1. *Backplane Connectors*

Connector	Description
J20	DB-9 RS-232 connector
J21	LAN 10base2 connector
J22	LAN 10baseT connector
P1 - P4	64-pin Telco connectors
TB1	Five-position power-terminal strip
FGND	Frame ground lug

Power

The COT shelf backplane has a five-position power-terminal strip (TB1) that provides connections for redundant -48 Vdc, common battery return, and frame ground to each of the card slots by way of screw terminals. The COT shelf can be wired for redundant powering or single-source powering depending upon requirements.

Use the frame ground lug located on the upper left corner of the COT shelf backplane, with 2.6 mm wire to ground the COT shelf. This is the preferred frame ground connection point.

COLU HDSL

Each COLU slot is equipped with eight wire-wrap pins for xDSL interfaces.

Subscriber Pairs

A total of 128 two-wire subscriber pairs terminate at the Telco connectors P1, P2, P3, and P4, on the COT shelf backplane. Eight pairs route to each of the sixteen COLUs. At present up to six pairs are supported by existing COLU's. The additional two pairs are for future COLU configurations. See Tables 5 through 8 for P1, P2, P3, and P4 connector pinouts.

Alarm Cutoff

The COT shelf backplane provides a wire-wrap pin for connection to an external alarm cutoff circuit.

Alarm Contacts

The COT shelf provides access to the PAU alarm relays through the wire-wrap pins on the COT shelf backplane. Both normally open (NO) and normally closed (NC) relay operation is supported. Figure 4 shows the configuration of the alarm relays.

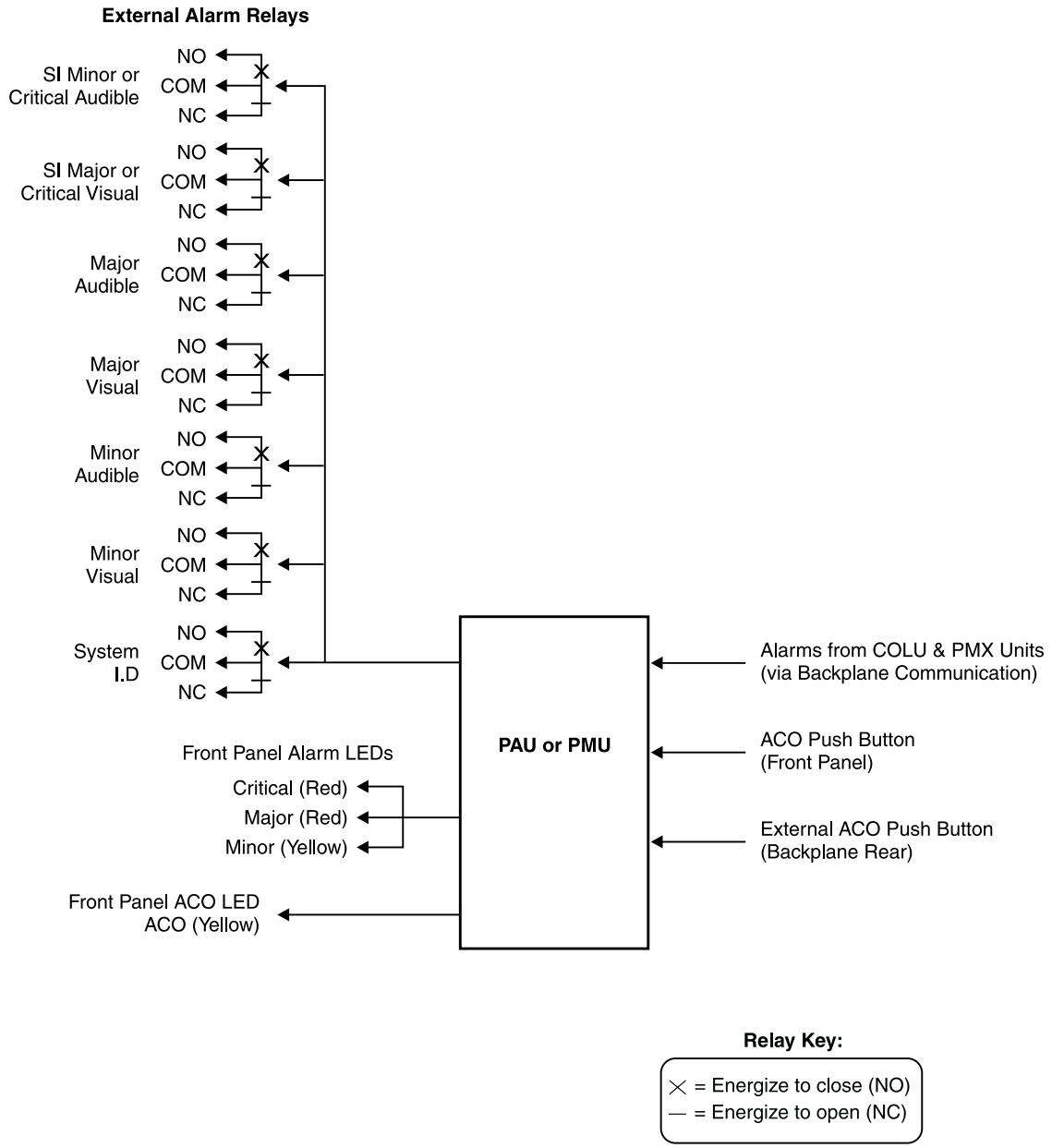


Figure 4. *Alarm Relay Contacts from PAU to Wire-Wrap Field*

LAN Interface

The PCS-818 provides three Local Area Network (LAN) interfaces. The three types of LAN connectors are as follows:

- DB-9 RS-232 Connector (Figure 5 and Table 2 lists the pinouts)
- 10Base-2 Connector (see Figure 6)
- 10Base-T interface Connector (see Figure 6)

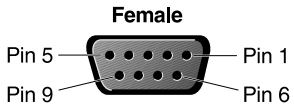


Figure 5. *DB-9 Front View Female Connector Pins*

Table 2. *Pinouts for DB-9 RS-232 Connector*

Pin	Signal	I/O	Description
1	CD	Input	Carrier Detect
2	RD	Input	Receive Data
3	TD	Output	Transmit Data
4	DTR	Output	Data Terminal Ready
5	GND		Signal Ground
6	NC		
7	NC		
8	NC		
9	NC		

Figure 6 shows the 10Base-2 and 10Base-T LAN interface connectors.

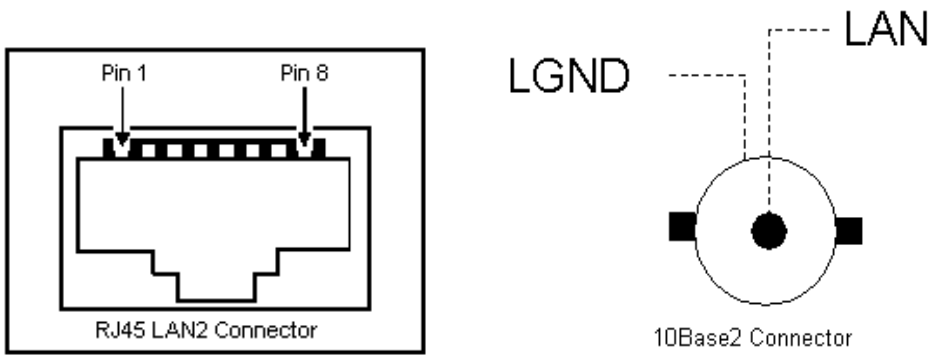


Figure 6. *LAN Connectors*

E1 Connections

The COT shelf provides connections for eight G.703 (E1) inputs through the wire-wrap pins located at the bottom right-hand side of the COT shelf backplane. The COT shelf backplane also provides wire-wrap pins for an external reference clock.

SPECIFICATIONS

Dimensions	
Height	222 mm, 8.7 in.
Width	533 mm ETSI, 21in., 482 mm (19-inches EIA)
Depth	30.48 mm, 1.2 in.
Weight	6.35 K g, 14 lbs.
Mounting	19-inch or ETSI equipment rack using universal mounting brackets
Environment	
Temperature	–40 °C to + 65 °C; –40 °F to + 150 °F
Humidity	5% to 95% (noncondensing)
Altitude	–60 m MSL to 4,000 m MSL
Power	–48 Vdc, maximum rated current, 20A

INSTALLATION PROCEDURES

REQUIRED TOOLS AND TEST EQUIPMENT

The tools and test equipment required for the installation of the COT shelf are:

- One wire-wrap tool for .045-inch square pins
- One #2 Phillips screwdriver
- One flat-head screwdriver
- One pair wire-strippers
- One pair side-cutters
- One Volt-Ohmmeter

POWER

The COT shelf uses –48 Vdc CO battery. This voltage must be fused on a fuse panel in the CO. The fuse rating depends on the powering option used.

Table 3 summarizes the current drawn by the PCS-818 COT shelf, when it is fully populated with services listed for a battery voltage of –48.0 Vdc and with all CO and RT distances at their maximum DSL reach. The table provides the average current drawn from a fully populated shelf under the max condition.

These conditions assume that at every customer site will have all POTS lines are off hook. The configuration used for computing Table 3 is sixteen COLUs, and one PAU/PMU.

Table 3. *PCS-818 Shelf Supply Current*

Service	Models	Average [a] battery current	Recommended fuse [b]	Power Dissipation
4 POTS	PLL-820, PRL-870	5.5 A	7.5 A	122.0 W
6 POTS	PLL-821, PRL-871	6.6 A	10.0 A	146.0 W

(a) Indicates the current when all lines are off hook with all DSL lines at MAX length with –48Vdc battery.
(b) Indicates the recommended fuse allowed for 42.5 Vdc battery and 15% fuse margin.

MOUNTING

The PCS-818 can accommodate the EIA 19 inch frames and ETS 300 119-3 frames. The mounting bracket can be reversed to accommodate the hole spacing of either frame. The PCS-818 occupies nine Standard Height Units (H-SU) or the ETS frame (one HS-U equals 25mm).

WIRING ACCESS

All wiring to the COT shelf is done on the backplane.

ALARM LEADS

Audible and visual alarm leads from the CO alarm panel to the COT shelf must be provided. Run the Alarm leads down the side of the COT shelf mounting frame.

HDSL LINES

One pair of leads from the COT shelf to the HDSL pair Tip and Ring at the distribution frame must be provided for each system in the COT shelf. These leads should be dressed along the side of the frame per local practices.

SUBSCRIBER LINES

Four 64-pin connector-ended (female) cables per system are required for connecting the COT shelf to the CO switch subscriber line circuits at the distribution frame. Dress the cables along the sides of the frame per local practices.

CONNECTIONS

The following sections describe the various ground and power connections for the PCS-818.

Ground Connections

Frame Ground must be connected to provide discharge path for outside plant protection circuits.

Two Frame Ground termination points are provided on the COT shelf. The preferred termination point is the FGND lug. The FGND lug and TB1 FGND Frame Ground termination points are electrically equivalent. To ground the COT shelf, perform one of the following options.

FGND Lug Connection

The FGND connection is located on the upper left corner of the COT shelf backplane. This ground lug accepts wire in the range of 3.3 mm to 4.1 mm. To connect the FGND lug connection, do the following:

1 Using a wire gauge of the same size as the common equipment frame ground wire, remove 1.6 cm of insulation and insert into the ground lug.

2 Using a flat-head screwdriver, secure the wire in the lug.

3 Attach the other end to the common equipment frame ground using locally approved methods.

TB1 FGND Connection

The five-position power-terminal strip termination point, TB1, is on the COT shelf backplane. A minimum of 3.3 mm wire should be used for this connection. To connect the TB1 FGND connection, do the following:

1 Using a minimum of 3.3 mm wire, attach a spade lug connector to terminate the ground wire on the FGND terminal of TB1.

2 Connect the other end of the frame ground wire to the CO Frame Ground termination point using locally approved methods.

Power Connections

The TB1 termination point on the COT shelf backplane provides connections for dual –48 Vdc, common battery return, and frame ground to each of the card slots by way of screw terminals. The COT shelf can be wired for redundant powering, or single-source powering depending upon requirements. The following sections describe the two powering options available on this device. The preferred powering method is redundant-COT shelf powering. Prior to performing any power connections:

1 Remove all fuses in the equipment bay's fuse panel for the circuit where the PG-Flex^{Plus} –48 Vdc power leads are terminated until the COT shelf is wired and ready for turn-up.

2 Run the battery and battery return lines from the fuse panel to the COT shelf mounting frame using a minimum of 3.3 mm wire.

3 Connect to a reliably grounded –48 Vdc source that is electrically isolated from the AC source.

4 The branch circuit overcurrent protection shall be rated –48 Vdc, 20 A maximum. Refer to the appropriate COLU Technical Practice to determine whether fusing values less than 15 Amp can be used or see Table 3 on page 8 for detail information about “PCS-818 Shelf Supply Current”.

5 Disconnect both input supply sources before servicing.

Redundant-COT Shelf Powering

Each circuit card in the COT shelf receives power from two –48 Vdc sources. If one –48 Vdc source is lost, the other –48 Vdc source provides power to the COT shelf circuit cards. Each –48 Vdc source is fused at maximum rated current or according to the application specific value.

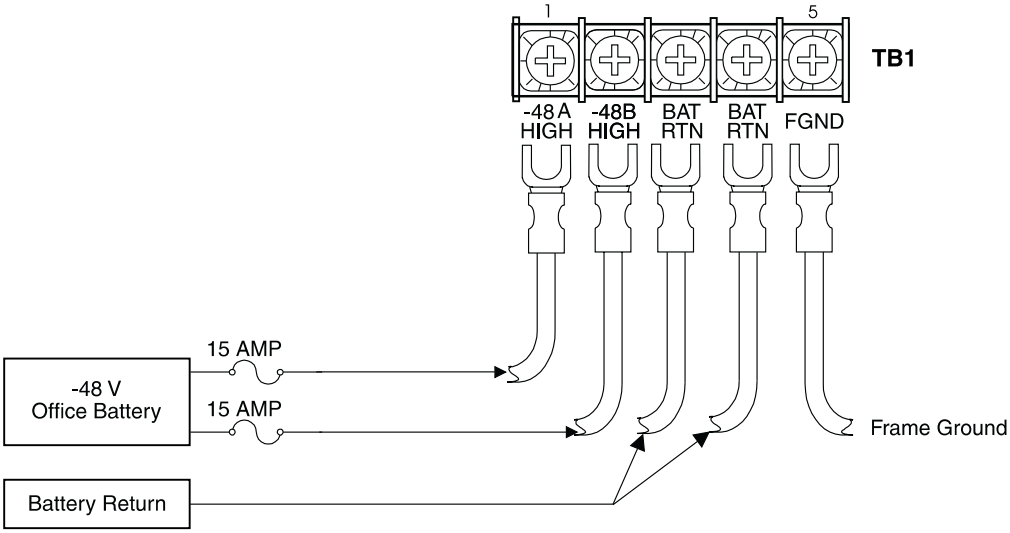


Figure 7. *Redundant COT Shelf Power Wiring*

Single-Source Powering

The entire shelf can be powered from a single source of –48 Vdc power fused at 20 amps. To connect the single-source powering, do the following:

1 Ensure that the frame ground connection is in place.

2 Connect a wire to the –48A terminal at TB1 (Figure 8). Connect the opposite end of this wire to the –48 Vdc CO battery supply at the fuse panel.

3 Connect a wire to the Battery Return terminal in position 4 of TB1. Connect the opposite end of this wire to the battery return of the CO battery supply at the fuse panel.

4 Connect a jumper wire from the –48A terminal of TB1 to the –48B terminal of TB1.

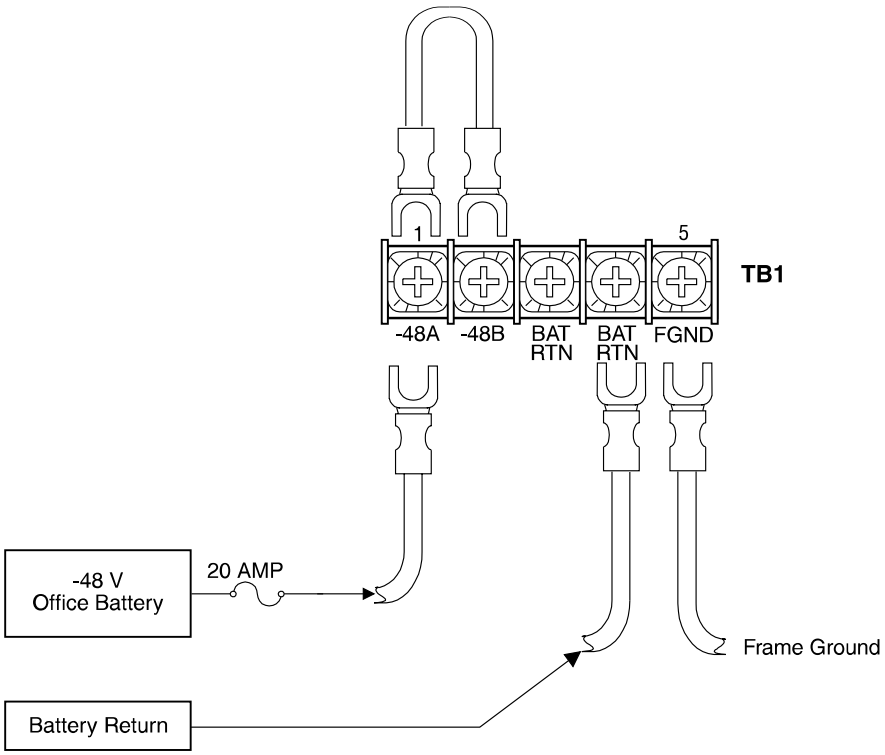


Figure 8. *Single-Source Power Wiring*

Audible and Visual Alarm Connections

Use a wire-wrap tool to terminate the alarm leads from the external alarm equipment on the alarm relay wire-wrap field. Table 4 shows the layout of the wire-wrap pins on the COT shelf backplane.

If a remote ACO switch is to be wired, refer to “External ACO Connection” on page 15 the for wire-wrap pin field location.

Table 4. *Alarm Relay Wire-Wrap Field*

System Alarms	Critical Visual	Critical Audible	Minor Visual	Minor Audible	Major Visual	Major Audible
Normally Open	Normally Open	Normally Open	Normally Open	Normally Open	Normally Open	Normally Open
Common	Common	Common	Common	Common	Common	Common
Normally Closed	Normally Closed	Normally Closed	Normally Closed	Normally Closed	Normally Closed	Normally Closed

Subscriber Connections From CO

Subscriber lines from the CO are connected to the COT shelf by way of four 64-pin Telco connectors (P1, P2, P3, and P4). Tables 5 through 8 show how the subscriber services are assigned at the Telco connectors.

External Clock Connections

This step is required only if a card is populated in the MUX slot and external synchronization is desired.

The shelf can accept an external 2.048 MHz synchronization reference.

To terminate the clock leads from the Telco Timing Source Generator to the COT shelf backplane, do the following:

1 Connect tip of the synchronization reference to EXTCLK_T.

2 Connect ring of the synchronization reference to EXTCLK_R.

3 Connect shield of the synchronization reference to FGND.

Figure 9 shows the rear view of the COT shelf backplane.

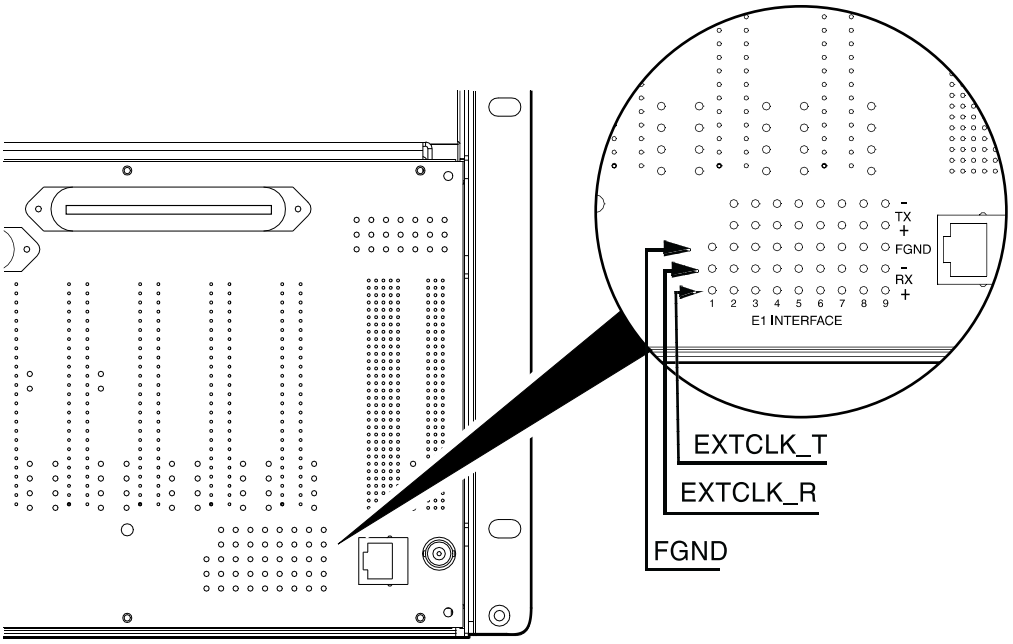


Figure 9. *External Clock Connections*

HDSL Wiring

Each COLU shelf slot has wiring to support four HDSL interfaces A, B, C, and D. These interfaces terminate on wire wrap pins.

COLUs that provide an HDSL interface (for example, PLL-820, PLL-821) utilize the "A" interface.

1 Connect the tip wiring to the A interface "T" pin.

2 Connect the ring wiring to the A interface "R" pin.

External ACO Connection

The ACO connection is made on the pins labeled ACO RET and EXT ACO. To control the ACO remotely, momentarily connect the ACO RET and the EXT ACO pins.

TURN-UP AND TEST

Perform the following steps before you install circuit cards in the COT shelf.

1 Verify correct termination of all the HDSL lines on the wire-wrap field on the COT shelf backplane.

2 Install the fuses in the CO fuse panel for the circuits providing –48 Vdc power to the COT shelf. Observe that the fuses will not blow when installed.

3 Verify that there is between –42 Vdc and –56 Vdc between each of the –48 Vdc terminals and BAT RTN on TB1 on the COT shelf backplane.

4 Measure the dc voltage across the HDSL terminations. Ensure that there are 0 Vdc between the Tip and Ring, Tip and Ground, and Ring and Ground of each HDSL circuit terminated on the COT shelf.

5 Measure the resistance across the terminals of the HDSL pairs. There should be at least 100 kΩ of resistance across the Tip and Ring, Tip and Ground, and Ring and Ground of each HDSL circuit terminated on the COT shelf backplane.

6 **Optional** - Refer to the PSU-795 *Technical Practice* for verifying the COT shelf installation.

REFERENCE TABLES

Tables 5 through 8 show the assignment of subscriber services from each card slot location to the Telco connectors.

Table 5. *P1 Tip and Ring Pin Assignments*

COT Shelf Cardslot	COLU Type			COT Shelf Connector Assignments	
	PLL-820	**PLL-821**	**PLL-822**	**Tip**	**Ring**
LU1	POTS1	POTS1	POTS1	P1-33	P1-1
	POTS2	POTS2	POTS2	P1-34	P1-2
	POTS3	POTS3	POTS3	P1-35	P1-3
	POTS4	POTS4	ISDN	P1-36	P1-4
		POTS5		P1-37	P1-5
		POTS6		P1-38	P1-6
				P1-39	P1-7
				P1-40	P1-8
LU2	POTS1	POTS1	POTS1	P1-41	P1-9
	POTS2	POTS2	POTS2	P1-42	P1-10
	POTS3	POTS3	POTS3	P1-43	P1-11
	POTS4	POTS4	ISDN	P1-44	P1-12
		POTS5		P1-45	P1-13
		POTS5		P1-46	P1-14
				P1-47	P1-15
				P1-48	P1-16
LU3	POTS1	POTS1	POTS1	P1-49	P1-17
	POTS2	POTS2	POTS2	P1-50	P1-18
	POTS3	POTS3	POTS3	P1-51	P1-19
	POTS4	POTS4	ISDN	P1-52	P1-20
		POTS5		P1-53	P1-21
		POTS6		P1-54	P1-22
				P1-55	P1-23
				P1-56	P1-24
LU4	POTS1	POTS1	POTS1	P1-57	P1-25
	POTS2	POTS2	POTS2	P1-58	P1-26
	POTS3	POTS3	POTS3	P1-59	P1-27
	POTS4	POTS4	ISDN	P1-60	P1-28
		POTS5		P1-61	P1-29
		POTS6		P1-62	P1-30
				P1-63	P1-31
				P1-64	P1-32

Table 6. *P2 Tip and Ring Pin Assignments*

COT Shelf Cardslot	COLU Type			COT Shelf Connector Assignments	
	PLL-820	**PLL-821**	**PLL-822**	**Tip**	**Ring**
LU5	POTS1	POTS1	POTS1	P2-33	P2-1
	POTS2	POTS2	POTS2	P2-34	P2-2
	POTS3	POTS3	POTS3	P2-35	P2-3
	POTS4	POTS4	ISDN	P2-36	P2-4
		POTS5		P2-37	P2-5
		POTS6		P2-38	P2-6
				P2-39	P2-7
				P2-40	P2-8
LU6	POTS1	POTS1	POTS1	P2-41	P2-9
	POTS2	POTS2	POTS2	P2-42	P2-10
	POTS3	POTS3	POTS3	P2-43	P2-11
	POTS4	POTS4	ISDN	P2-44	P2-12
		POTS5		P2-45	P2-13
		POTS5		P2-46	P2-14
				P2-47	P2-15
				P2-48	P2-16
LU7	POTS1	POTS1	POTS1	P2-49	P2-17
	POTS2	POTS2	POTS2	P2-50	P2-18
	POTS3	POTS3	POTS3	P2-51	P2-19
	POTS4	POTS4	ISDN	P2-52	P2-20
		POTS5		P2-53	P2-21
		POTS6		P2-54	P2-22
				P2-55	P2-23
				P2-56	P2-24
LU8	POTS1	POTS1	POTS1	P2-57	P2-25
	POTS2	POTS2	POTS2	P2-58	P2-26
	POTS3	POTS3	POTS3	P2-59	P2-27
	POTS4	POTS4	ISDN	P2-60	P2-28
		POTS5		P2-61	P2-29
		POTS6		P2-62	P2-30
				P2-63	P2-31
				P2-64	P2-32

Table 7. *P3 Tip and Ring Pin Assignments*

COT Shelf Cardslot	COLU Type			COT Shelf Connector Assignments	
	PLL-820	**PLL-821**	**PLL-822**	**Tip**	**Ring**
LU9	POTS1	POTS1	POTS1	P3-33	P3-1
	POTS2	POTS2	POTS2	P3-34	P3-2
	POTS3	POTS3	POTS3	P3-35	P3-3
	POTS4	POTS4	ISDN	P3-36	P3-4
		POTS5		P3-37	P3-5
		POTS6		P3-38	P3-6
				P3-39	P3-7
				P3-40	P3-8
LU10	POTS1	POTS1	POTS1	P3-41	P3-9
	POTS2	POTS2	POTS2	P3-42	P3-10
	POTS3	POTS3	POTS3	P3-43	P3-11
	POTS4	POTS4	ISDN	P3-44	P3-12
		POTS5		P3-45	P3-13
		POTS5		P3-46	P3-14
				P3-47	P3-15
				P3-48	P3-16
LU11	POTS1	POTS1	POTS1	P3-49	P3-17
	POTS2	POTS2	POTS2	P3-50	P3-18
	POTS3	POTS3	POTS3	P3-51	P3-19
	POTS4	POTS4	ISDN	P3-52	P3-20
		POTS5		P3-53	P3-21
		POTS6		P3-54	P3-22
				P3-55	P3-23
				P3-56	P3-24
LU12	POTS1	POTS1	POTS1	P3-57	P3-25
	POTS2	POTS2	POTS2	P3-58	P3-26
	POTS3	POTS3	POTS3	P3-59	P3-27
	POTS4	POTS4	ISDN	P3-60	P3-28
		POTS5		P3-61	P3-29
		POTS6		P3-62	P3-30
				P3-63	P3-31
				P3-64	P3-32

Table 8. *P4 Tip and Ring Pin Assignments*

COT Shelf Cardslot	COLU Type			COT Shelf Connector Assignments	
	PLL-820	**PLL-821**	**PLL-822**	**Tip**	**Ring**
LU13	POTS1	POTS1	POTS1	P4-33	P4-1
	POTS2	POTS2	POTS2	P4-34	P4-2
	POTS3	POTS3	POTS3	P4-35	P4-3
	POTS4	POTS4	ISDN	P4-36	P4-4
		POTS5		P4-37	P4-5
		POTS6		P4-38	P4-6
				P4-39	P4-7
				P4-40	P4-8
LU14	POTS1	POTS1	POTS1	P4-41	P4-9
	POTS2	POTS2	POTS2	P4-42	P4-10
	POTS3	POTS3	POTS3	P4-43	P4-11
	POTS4	POTS4	ISDN	P4-44	P4-12
		POTS5		P4-45	P4-13
		POTS5		P4-46	P4-14
				P4-47	P4-15
				P4-48	P4-16
LU15	POTS1	POTS1	POTS1	P4-49	P4-17
	POTS2	POTS2	POTS2	P4-50	P4-18
	POTS3	POTS3	POTS3	P4-51	P4-19
	POTS4	POTS4	ISDN	P4-52	P4-20
		POTS5		P4-53	P4-21
		POTS6		P4-54	P4-22
				P4-55	P4-23
				P4-56	P4-24
LU16	POTS1	POTS1	POTS1	P4-57	P4-25
	POTS2	POTS2	POTS2	P4-58	P4-26
	POTS3	POTS3	POTS3	P4-59	P4-27
	POTS4	POTS4	ISDN	P4-60	P4-28
		POTS5		P4-61	P4-29
		POTS6		P4-62	P4-30
				P4-63	P4-31
				P4-64	P4-32

ABBREVIATIONS

AWG	American Wire Gauge
CO	Central Office
COLU	Central Office Line Unit
COT	Central Office Terminal
EIA	Electronic Industries Association
ESD	Electrostatic Discharge
ETSI	European Telecommunications Standards Institute
HDSL	High-bit-rate Digital Subscriber Line
ICOLU	Integrated Central Office Line Unit
LAN	Local Area Network
LED	Light-emitting Diode
LS/GS	Loop Start/Ground Start
MLT	Mechanized Loop Test
NC	Normally Closed
NO	Normally Open
PAU	PG-Plus Alarm Unit
PCM	Pulse Code Modulation
PMU	PG-Plus Management Unit
PMX	PG-Plus Multiplexer Unit
POTS	Plain Old Telephone Service
REN	Ringer Equivalence
RLU	Remote Line Unit Card
RMA	Return Materials Authorization
RT	Remote Terminal
SCB	Serial Communication Bus
UVG	Universal Voice Grade

PRODUCT SUPPORT

TECHNICAL SUPPORT

PairGain Technologies, Inc. Technical Assistance is available 24 hours a day, 7 days a week by contacting PairGain Customer Service Engineering group at:

Telephone: 800.638.0031 or 714.832.9922

Fax: 714.832.9924

Email: support@pairgain.com

During normal business hours (7:30 AM to 5:30 PM, Pacific Time, Monday - Friday, excluding holidays), technical assistance calls are normally answered directly by a Customer Service Engineer. At other times, a request for technical assistance is handled by an on-duty Customer Service Engineer through a callback process. This process normally results in a callback within 30 minutes of initiating the request.

LIMITED WARRANTY

PairGain warrants that, for a period of 12 months from the date of shipment and under normal use, the hardware portion of its products will be free of material defects and faulty workmanship, under normal use. PairGain's obligation, under this warranty, is limited to replacing or repairing, at PairGain's option, any such hardware product which is returned during the 12-month warranty period per PairGain's instructions and which product is confirmed by PairGain not to comply with the foregoing warranty.

PairGain warrants that, for a period of 30 days from the date of purchase, the software furnished with its products will operate substantially in accordance with the PairGain published specifications and documentation for such software. PairGain's entire liability for software that does not comply with the foregoing warranty and is reported to PairGain during the 30-day warranty period is, at PairGain's option, either (a) return of the price paid or (b) repair or replacement of the software.

PairGain also warrants that, for a period of 30 days from the date of purchase, the media on which software is stored will be free from material defects under normal use. PairGain will replace defective media at no charge if it is returned to PairGain during the 30-day warranty period along with proof of the date of shipment. The transportation charges for shipment of returned products to PairGain will be prepaid by the Buyer. PairGain will pay transportation charges for shipment of replacement products to Buyer, unless no trouble is found (NTF), in which case the Buyer will pay transportation charges.

PairGain may use reconditioned parts for such repair or replacement. This warranty does not apply to any product which has been repaired, worked upon, or altered by persons not authorized by PairGain or in which PairGain's sole judgment has been subjected to misuse, accident, fire or other casualty, or operation beyond its design range.

The warranty for repaired products shall remain in effect until the end of the original warranty period.

PAIRGAIN DISCLAIMS ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO ITS PRODUCTS AND ANY ACCOMPANYING WRITTEN MATERIALS. FURTHER, PAIRGAIN DOES NOT WARRANT THAT SOFTWARE WILL BE FREE FROM BUGS OR THAT ITS USE WILL BE UNINTERRUPTED AND MAKES NO WARRANTIES REGARDING THE USE, OR THE RESULTS OF THE USE, OF THE SOFTWARE IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY OR OTHERWISE.

ADVANCE REPLACEMENT

Any product determined by PairGain not to comply with the applicable warranty within 30 calendar days from the date of shipment to the Buyer, or as otherwise authorized, are eligible for advance replacement free of charge. A replacement product will be shipped to the Buyer within 24 hours of PairGain's receipt of notification from the Buyer.

If products returned to PairGain for advance replacement are not received by PairGain within 30 calendar days of shipment of the replacement product or if no trouble is found (NTF) as determined by PairGain, the Buyer will be responsible for payment of the cost of the replacement product.

BILLING

PairGain's repair of products returned for repair, replacement, or credit, whether in warranty or out of warranty, which are found to be damaged due to customer negligence or which have had parts removed will be billed at prevailing time and material rates.

In the event that the returned equipment is not covered by warranty, PairGain will contact the customer with estimated repair or replacement charges and obtain customer disposition of the product if a purchase order has not been provided.

Equipment returned for repair or replacement is subject to a $250 per unit no trouble found (NTF) charge in the event that diagnostic evaluation reveals no evidence of functional failure or physical defects.

RETURNING A PRODUCT

To return equipment to PairGain:

1. Locate the number of the purchase order under which the equipment was purchased. To obtain a return authorization number, you need to provide the original purchase order number to PairGain's Return Material Authorization (RMA) Department.
2. Call or write PairGain's RMA Department to ask for an RMA number and any additional instructions. Use the telephone number, fax number or email address listed below:
   - Telephone: 800.370.9670
   - Fax: 714.832.9923
   - Email Address: rma@pairgain.com
3. Include the following information, in writing, along with the equipment you are returning:
   - Company name and address.
   - Contact name and telephone number.
   - The shipping address to which PairGain should return the repaired equipment.
   - The original purchase order number.
   - A description of the equipment that includes the model and part number of each unit being returned, as well as the number of units that you are returning.
   - The reason for the return. For example:
     - The equipment needs an ECO/ECN upgrade.
     - The equipment is defective.

If the equipment is defective, please tell us what you observed just before the equipment malfunctioned. Be as detailed in your description as possible.

If there is another reason for returning the equipment, please let us know so we can determine how best to help you.

4 Pack the equipment in a shipping carton.

5 Write PairGain's address and the RMA Number you received from the RMA Department clearly on the outside of the carton and return to:

PairGain Technologies, Inc.
14352 Franklin Ave.
Tustin, CA 92780-7013

Attention: **RMA (Number)**

All shipments are to be returned prepaid. PairGain will not accept any collect shipments.

FCC COMPLIANCE

This unit is designed to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the situation by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Consult the dealer or an experienced radio or television technician for help.

MODIFICATIONS

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by PairGain Technologies, Inc. voids the user's warranty.

All wiring external to the product(s) should follow the provisions of the current edition of the National Electrical Code.

Corporate Office

14402 Franklin Avenue
Tustin, CA 92780

Tel: 714.832.9922
Fax: 714.832.9924

For Technical Assistance:

800.638.0031